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DENISON MINES LIMITED

PILOT STUDY

ON

PYRITE AND RADIOISOTOPE REMOVAL

BY FLOTATION

CONTRACTOR: KILBORN LTD.

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TABLE OF CONTENTS

	Page No.
ABSTRACT	1
INTRODUCTION	
Decontamination of Elliot Lake Tailings	2
The Denison Mill	2
Denison Tailings Disposal and Effluent Treatment	3
PILOT PLANT TESTINGS	
Flowsheet I	5
Flowsheet II	5
DISCUSSION OF RESULTS	
Pyrite Removal	9
Uranium and Isotope Removal	9
CONCLUSIONS	11
APPENDIX	
Daily Metallurgical Results, Flowsheet I	12
Daily Metallurgical Results, Flowsheet II	17
Metallurgical Results - Test Composite	35
Metallurgical Results - Test Average	36
Size Analysis and Assay Distribution:	
Flotation Feed Composite	37
Pyrite Rougher Concentrate Composite	38
Isotope Rougher Tail Composite	39
Pyrite Rougher Tail Composite	40
Isotope Rougher Concentrate Composite	41
Isotope Scavenger Concentrate Composite	42
Final Tail Composite	43
Final Tail Truck Composite Analysis	44
Analysis of Repulping Solution	45

ABSTRACT

OBJECTIVE:

(1) To determine the amount of pyrite, uranium, radium^{226} and thorium which can be removed from uranium tailings by a flotation operation.

(2) To provide a relatively pyrite-free tailings with minimal radium, uranium, and thorium content for use in another research study on improving the seepage from uranium tailings basins:

SCOPE:

Flotation circuits similar to that shown in the attached flowsheets were assembled at the Denison mill and approximately 300 tons of mill tailings processed at a feed rate of 1 to 1.5 tons per hour. Samples of all flotation products were taken and analyzed for pyrite and radio-isotope elements. Approximately 200 tons (wet cake basis) of pilot plant tailings were transported to the test pit of Rio Algom Limited for the above mentioned study.

CONCLUSIONS:

(1) The pilot demonstration results indicate that the flotation approach to decontamination of uranium mill tailings rejects over 98 % of the pyrite, and produces a practically pyrite-free tailings.

(2) Over 65 % of the radium^{226}, 75% of the thorium and about 55 % of uranium is also rejected from the mill tailings.

(3) The pyrite concentrate comprises about 10 % of the weight and the uranium-radium-thorium concentrate about 20 % of the weight of the original uranium tailings.

INTRODUCTION

Decontamination of Elliot Lake Uranium Tailings:

The Canada Centre for Mineral and Energy Technology (Canmet), Department of Energy, Mines and Resources have been actively engaged in research to demonstrate the removal of pyrite, radium-226, uranium and thorium by flotation from uranium tailingsat Elliot Lake. The testwork done in Ottawa on a laboratory and continuous bench-scale operation showed that over 95 % of the pyrite, 60 % of the uranium, 65 % of the radium-226, and 65 % of the thorium could be removed from the tailings. (CANMET report: MRP/MSL 77-387(IR),December,1977 by D. Raicevic).

On the basis of these findings, Canmet felt that the stage had been reached to demonstrate this technology on a pilot scale at one of the operating mines at Elliot Lake. The Denison mill was chosen as the site and testwork began in August, 1978 with two prime objectives in mind:

(1) To determine the amount of pyrite, uranium, radium-226 and thorium which could be removed from the tailings by a flotation operation.

(2) To provide relatively pyrite-free tailings with a minimal radium, uranium, and thorium content for use in another research study on improving the seepage from tailings basins.

The Denison Mill

Denison Mines Limited is located in the Elliot Lake area of Northern Ontario, approximately 10 miles north of the town of Elliot Lake. The ore body is located in the Huronian Sediments on the north limb of the Quirke Lake syncline.

The milling complex was originally designed for the treatment of 6,000 tons of ore, and has been expanded to accommodate 7,100 tons of

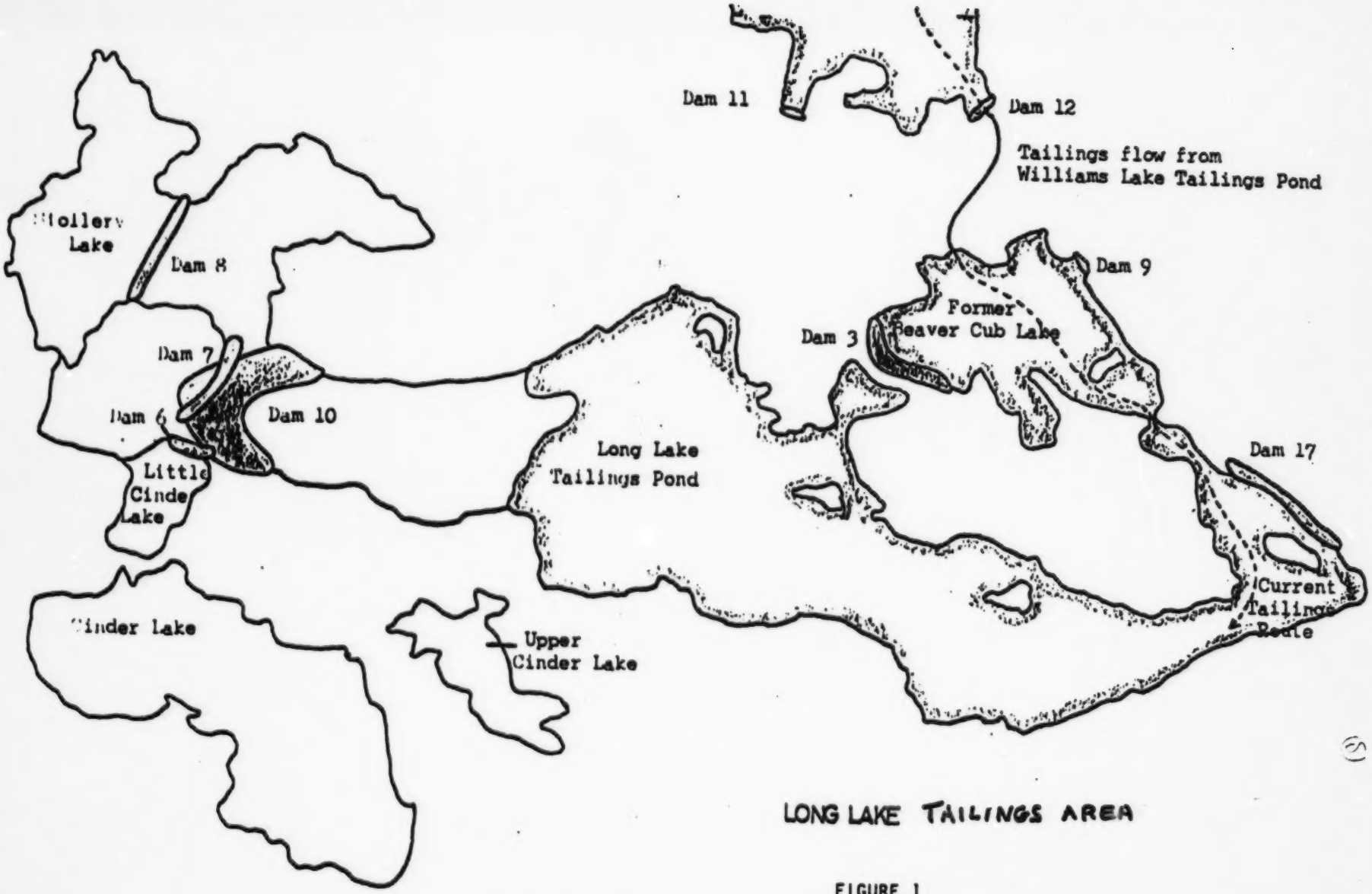
ore per day. Initial operation of the mill began in May, 1957.

Minerals of metallurgical significance and in approximate order of decreceasing abundance are: brannerite, uraninite, and monazite. Gangue minerals include guartz, chlorite, cericite pyrite,pyrrhotite and rutile. The specific gravity of the ore is 2.75 with a pyrite-pyrrhotite content of 6 percent and with silica amounting to 75 %.

The Denison flowsheet is based on sulphuric acid leaching to extract the uranium from the ore, liquid solid separation to wash the uranium-bearing solution from the barren ore, and ion exchange to concentrate the resultant pregnant solution. Precipitation of uranium with ammonia produces an ammonium diuranate yellow-cake.

Denison Tailings Disposal and Effluent Treatment

The mill tailings consist of filtered solids repulped with neutralized ion exchange barren solution. Slaked lime is added in sufficient quantity so that the pH of the effluent leaving the mill is pH 9.0 - pH 10.0. This results in a pH of 8.0 in the effluent leaving the secondary reservoir and entering the Serpent River system. The supernatant liquid that is decanted off the primary settling pond is treated with a 20 % barium chloride solution to form a barium-radium sulphate. The resulting precipitates are contained in a settling pond known as Stollery Lake which is located immediately downstream of the treatment facility. Figure 1 shows the general arrangement of the present tailings containment area.



LONG LAKE TAILINGS AREA

FIGURE 1

PILOT PLANT TESTING

Flowsheet I

This flowsheet was assembled based on the CANMET, CPDU Flowsheet, Scheme 1, given in the previously mentioned CANMET report and approximately 80 tons of solids processed. Feed was taken from the secondary repulper immediately following solid-liquid separation and prior to tailings neutralization to avoid depression of pyrite due to lime addition.

The flotation concentrates and tailings were sampled at regular intervals and then returned to the mill circuit for disposal. Daily composite samples of the following products were prepared and analyzed for radium^{226}, thorium, uranium and sulphide sulphur:

(1) feed tailings

(2) pyrite rougher concentrate

(3) pyrite rougher tailings

(4) isotope rougher concentrate

(5) final flotation tailings

(6) isotope cleaner concentrate

(7) isotope cleaner tailings

It became apparent during the operation of the isotopes rougher circuit that an increase in retention time was necessary during this flotation stage. For that reason the cleaner circuit was substituted by a scavenger isotopes circuit as shown in Flowsheet II, under the approval of CANMET's scientific authority, D. Raicevic.

Flowsheet II

Another 240 tons of tailings from the secondary repulper at the rate of approximately 1 to 1.5 tons per hour were processed of which approximately 200 tons (wet cake basis) of pyrite-free tailings were transported by truck to the test pit of Rio Algom Limited.

Flowsheet 11 (cont'd)

In both flowsheets "repulping solution" (pH = 3 - 4) was used as a diluting liquid while the CANMET CPDU operation used city water (pH = 8.2) for the same purpose.

Daily samples of the following products were taken during the pilot test run:

(1) feed tailings

(2) pyrite rougher concentrate

(3) pyrite rougher tails

(4) isotope rougher concentrate

(5) isotope rougher tails

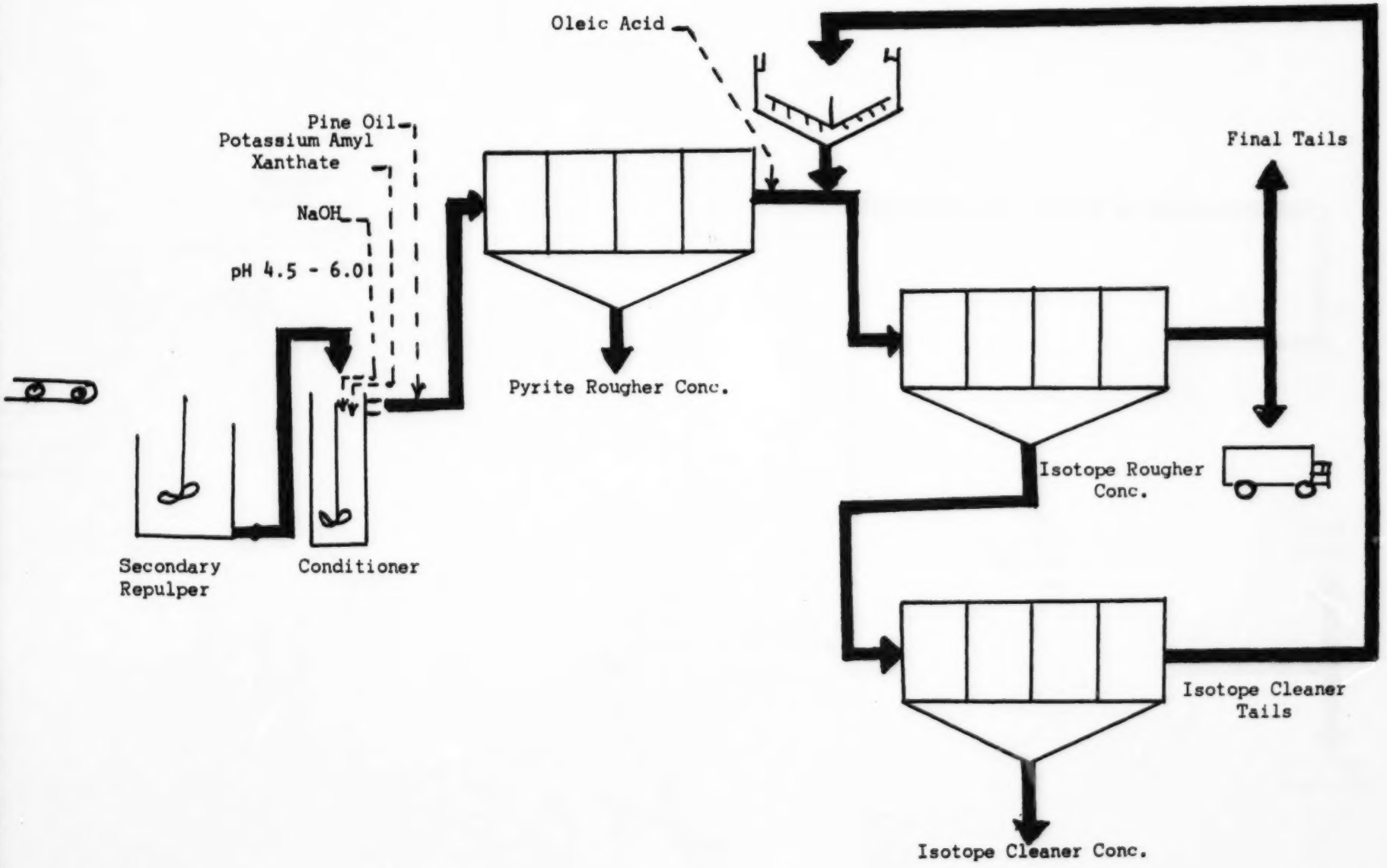
(6) isotope scavenger concentrate

(7) final flotation tailings

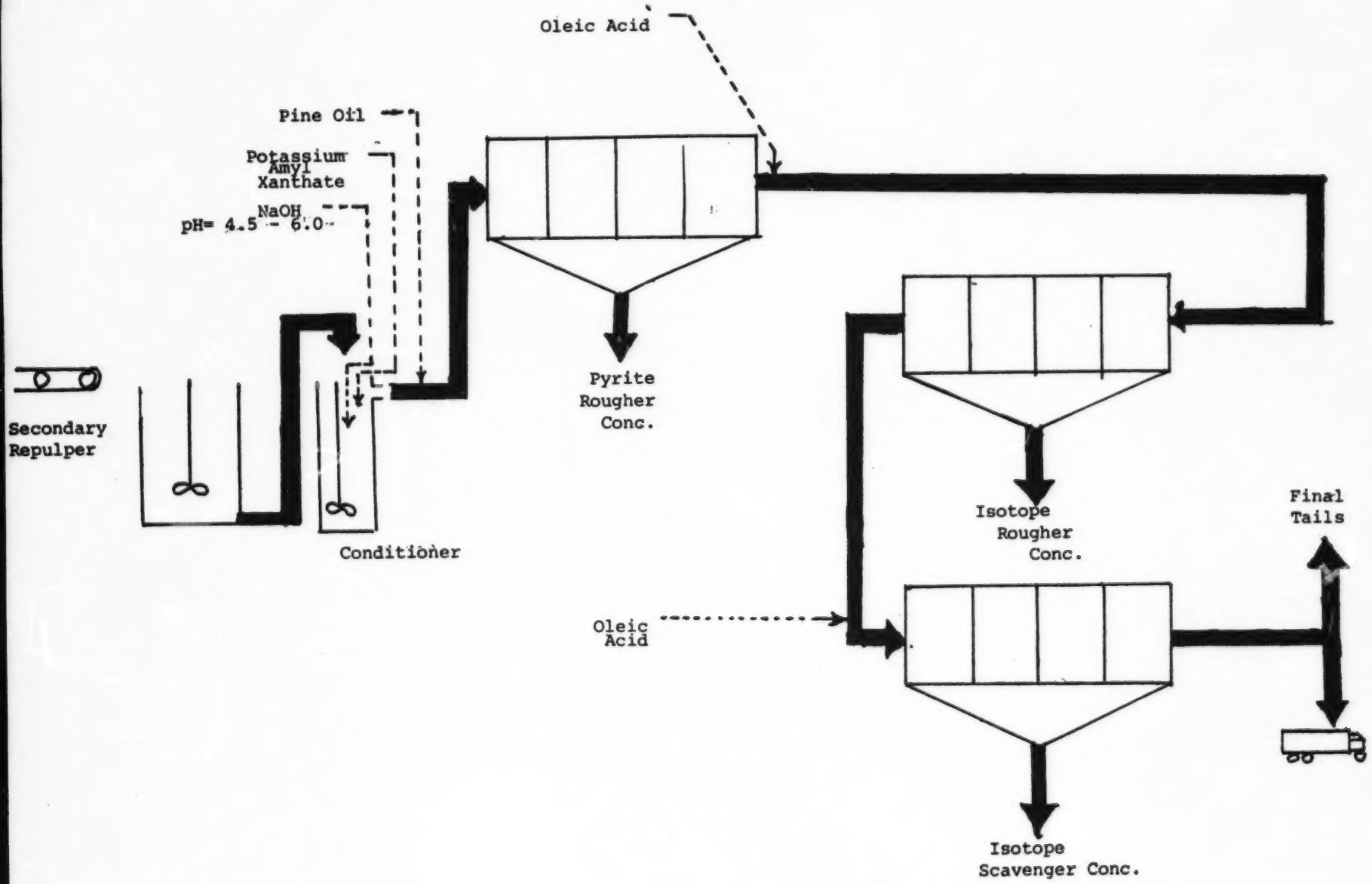
On a daily basis all samples were assayed for uranium, radium^{226}, thorium, and sulphide sulphur. On a weekly basis, the repulping solution was analyzed for dissolved radium^{226}, uranium and thorium.

At the end of the testing program a composite sample of all flotation products was prepared and analyses for uranium, radium^{226}, and thorium in the various size fractions were performed. In addition to the above samples, a "final tail truck composite" was prepared and analyzed to represent the tailings which were placed in the Rio Algom test pit.

FLOTATION PILOT PLANT FLOW 1



FLOTATION PILOT PLANT FLOW 2



DISCUSSION OF RESULTS

Pyrite Removal

The results of the pilot demonstration show that there is no difficulty in rejecting over 98 % of the pyrite from the mill tailings with an overall test recovery of 99 %. Within the duration of the test program, pyrite recovery posed no particular problem. The control strategy developed for this portion was to maximize pyrite recovery, however, this did result in the overall reagent consumption being higher than anticipated.

Results indicate that acceptable pyrite recoveries can be obtained at the desired reagent dosage rates that were achieved during the CANMET studies as indicated by the data tables toward the end of the test program.

Uranium and Isotope Removal

Tables 1 to 4 show the test results obtained during the initial operation of the pilot plant based on CANMET's original flowsheet. It became apparent from the beginning of the testwork that acceptable uranium and isotope removal was not being achieved during this stage of the operation and that a longer retention time was obvisouly required. Since the prime objective of the pilot demonstration was to minimize the uranium-radium-thorium in the final flotation tailings, and upon discussion with CANMET's scientific authority, it was decided that the cleaning flotation stage would be eliminated from the circuit and a scavenger flotation bank inserted into the flowsheet, to ensure maximum isotope recovery. The remaining portion of the experiment was performed using this scheme, the data for which is presented in tables 5 to 23.

In comparing the daily metallurgical results during the test period, the isotope recoveries appeared to continually improve as time

Uranium and Isotope Removal (cont'd)

progressed. This point can be directly attributed to better familiarization of the flotation technique by the operators and better feed control. Feed control problems existed during the early stages of the test program but were rectified quickly resulting in a much better, smoother type opration.

The elimination of uranium and isotopes peaked at a recovery of 84 % for uranium, 90 % for thorium and 84 % for radium^{226}, however weight rejection during this period was very high at 47 %. Under actual milling conditions this high weight rejection would be unsuitable as it would create tremendous concentrate disposal problems.

Tables 22 and 23 show the overall test results obtained during the pilot operation using the scheme shown in flowsheet 11. This data in these tables clearly shows that the work done by the CANMET continuous process development unit can be duplicated. The main difference in the results however, appear to be the radium^{226} values in the final decontaminated tailings which in the pilot test appear to be in the 100 pCi/g range while values based on test results from CANMET were in the 50 - 60 pCi/g range. It is felt that this difference is due to high radium content in the repulping solution (see table 32) of the leach residue while CANMET used city water (no radium) for the same purpose. Differences in the radium content in the final tailings can be also attributed to a difference in grind as shown in tables 24 to 30, which present the size and assay distribution of the various flotation products. It should again be mentioned that the present degree of accuracy of the radium^{226} analysis which varies by about 15 % could be another factor that could contribute to the difference in radium content between CANMET and Denison final pilot plant tailings. This could be particularly the case with the decontaminated flotation tailings where the radium content is low.

CONCLUSIONS

The pilot plant results show that over 98 % of the pyrite, 54 % of the uranium, 65 % of the radium^{226}, and 75 % of the thorium were rejected from the maill tailings. The concentrates produced comprised approximately 30 % by weight of the flotation circuit feed.

The new decontaminated tailings assayed:

.03 - .13 % sulphide S as pyrite

123 - 151 pCi/g radium^{226}

.0035 - .0037 % uranium

.014 - .017 % thorium

CONCLUSIONS

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.0035 - .0037 % uranium

.014 - .017 % thorium

APPENDIX

DAILY METALLURGICAL RESULTS

FLOWSHEET 1

AUGUST 21, TO AUGUST 27, 1978

TABLE 1

PYRITE RADIUM FLOTATION PLANT

AUGUST 21, 1978

PRODUCT	REAGENTS Collector K.A.X.	O.A.	Froth P.O.	% Weight	ASSAYS Sulphide S %	% U	% Th	pCi/g Ra226	DISTRIBUTION % Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	.08		1.3	9.1	28.06	.0076	.034	386	93.4	11.4	8.9	11.5
Isotope Rougher Conc.		2.7		4.0	4.48	.017	.25	2558	6.6	11.2	28.7	33.3
Combined Conc.				13.1	20.86	.011	0.10	1049	100.0	22.6	37.6	44.8
Cleaner Conc.												
Pyrite Rougher Tail				90.9	0.56	.0061	.035	249	6.6	88.6	91.1	88.5
Isotope Cleaner Tail					5.22	.015	.206	1857	-	-	-	-
Final Tail				86.9	0	.0054	.025	195	0	77.4	62.4	55.2
Feed (calc.)				100.0	2.73	.0061	.035	307	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.18	.0056	.029	242	100.0	100.0	100.0	100.0

TONS PER DAY = 22.0

K.A.X. Potassium Amyl Xanthate

O.A. Oleic Acid

P.O. Pine Oil

TABLE 2

PYRITE RADIUM FLOTATION PILOT PLANT - FLOWSHEET 1

AUGUST 22, 1978

PRODUCT	lbs/ton REAGENTS Collector K.A.X.	O.A.	Froth P.O.	% Weight	ASSAYS Sulphide S %	% U	% Th	pCi/g Ra226	DISTRIBUTION % Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.19		3.6	8.1	35.76	.0066	.035	409	95.0	9.6	9.9	11.6
Isotope Rougher Conc.		5.0		6.1	2.24	.011	.13	1296	4.5	12.1	27.6	27.7
Combined Conc.				14.2	21.36	.0085	.076	790	99.5	21.7	37.5	39.3
Cleaner Conc.				3.4	2.80	.015	.15	1696	3.1	9.2	17.7	19.4
Pyrite Rougher Tail				91.9	0.09	.0047	.028	263	5.0	90.4	90.1	88.4
Isotope Cleaner Tail				2.7	1.54	.012	.129	1355	1.4	2.9	9.9	8.3
Final Tail				85.8	0.02	.0053	.021	202	0.5	78.3	62.5	60.7
Feed (calc.)				100.0	3.05	.0058	.029	286	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.00	.0056	.028	254	100.0	100.0	100.0	100.0

TONS PER DAY = 22.0

K.A.X. Potassium Amyl Xanthate

O.A. Oleic Acid

P.O. Pine Oil

TABLE 3

PYRITE-RADIUM FLOTATION PILOT PLANT - FLOWSHEET 1 August 26, 1978.

PRODUCT	REAGENTS Collector K.A.X.	O.A.	Froth P.O.	% Weight	ASSAYS Sulphide S %	% U	% Th	pCi/g Ra226	DISTRIBUTION % Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.20		2.9	23.6	15.30	.0080	.046	481	94.1	32.7	31.4	35.9
Isotope Rougher Conc.		8.2		9.5	1.25	.010	.123	925	3.1	16.5	33.8	27.8
Combined Conc.				33.1	11.27	.0086	.068	608	97.2	49.2	65.2	63.7
Cleaner Conc.				3.5	1.82	.012	0.12	1516	1.2	6.2	12.6	10.4
Pyrite Rougher Tail				76.4	0	.0043	.031	273	5.9	67.3	68.6	64.1
Isotope Cleaner Tail				6.0	.59	.0058	.070	575	1.9	10.3	21.2	17.4
Final Tail				66.9	.16	.0044	.018	172	2.8	50.8	34.8	36.3
Feed (calc.)				100.0	3.84	.0058	.035	317	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.07	.0050	.035	337	100.0	100.0	100.0	100.0

TONS PER DAY = 17.6

K.A.X. Potassium Amyl Xanthate
O.A. Oleic Acid
P.O. Pine Oil

TABLE 4

PYRITE-RADIUM FLOTATION PILOT PLANT - FLOWSHEET 1 August 27, 1978

PRODUCT	REAGENTS Collector K.A.X.	O.A.	Froth P.O.	% Weight	ASSAYS Sulphide S %	% U	% Th	pCi/g Ra226	DISTRIBUTION % Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	.41		2.1	9.5	29.81	.010	.046	480	84.8	15.7	13.0	16.7
Isotope Rougher Conc.		4.2		4.7	1.65	.017	.24	1848	2.3	13.2	30.8	31.8
Combined Conc.				14.2	20.49	.012	.11	933	87.1	28.9	43.8	48.5
Cleaner Conc.				4.1	1.49	.018	.215	1555	2.0	11.6	27.0	27.8
Pyrite Rougher Tail				90.5	0.91	.0044	.050	252	15.7	84.3	87.0	83.3
Isotope Cleaner Tail				0.6	0.56	.010	0.13	949	0.3	1.6	3.8	4.0
Final Tail				85.8	0.50	.0050	.021	164	13.4	71.1	56.2	51.5
Feed (calc.)				100.0	3.33	.0060	.034	273	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.18	.0050	.033	240	100.0	100.0	100.0	100.0

TONS PER DAY = 18.1

K.A.X. Potassium Amyl Xanthate
O.A. Oleic Acid
P.O. Pine Oil

DAILY METALLURGICAL RESULTS

FLOWSHEET 11

AUGUST 29 TO SEPTEMBER 21,1978

PYRITE-RADIUM FLOTATION PILOT PLANT - FLOWSHEET 11

AUGUST 29, 1978

PRODUCT	lbs/ton REAGENTS			ASSAYS					DISTRIBUTION %			
	Collector K.A.H.	O.A.	Froth P.O.	Weight %	Sulphide S %	% U	% Th	pCi/s Ra226	Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.19		0.64	10.7	29.32	.012	.053	535	96.5	20.9	12.8	17.6
Isotope Rougher Conc.		1.8		9.1	0.65	.012	.149	923	1.8	17.8	30.5	25.8
Isotope Scavenger Conc.		0.8		8.0	0.52	.010	.125	722	1.3	13.1	22.5	17.6
Combined Conc.		2.6		27.8	11.65	.011	.105	715	99.6	51.8	65.9	61.0
Pyrite Rougher Tail				89.3	0.93	.0056	.040	289	3.5	79.1	87.2	82.4
Isotope Rougher Tail				80.2	0	.0048	.031	223	1.7	61.3	56.7	56.6
Final Tail				72.2	0.02	.0041	.021	176	0.4	48.2	34.1	39.0
Feed (calc.)				100.0	3.25	.0061	.044	326	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.32	.0069	.035	269	100.0	100.0	100.0	100.0

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

TONS PER DAY = 15.0

TABLE

PYRITE-RADIUM FLOTATION PILOT PLANT - FLOWSHEET 11 AUGUST 30, 1978

PRODUCT	lbs/ton REAGENTS			ASSAYS					DISTRIBUTION %			
	Collector K.A.H.	O.A.	Froth P.O.	Weight %	Sulphide S %	% U	% Th	pCi/s Ra226	Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.42		3.3	12.3	21.27	.0076	.037	371	80.1	12.9	10.5	14.1
Isotope Rougher Conc.		2.7		21.0	1.23	.012	.114	704	7.9	34.8	55.5	45.6
Isotope Scavenger Conc.		2.6		3.2	0.19	.010	.081	515	0.2	4.4	6.0	5.1
Combined Conc.		5.3		36.5	7.89	.010	.085	575	88.2	52.1	72.0	64.8
Pyrite Rougher Tail				87.7	0.25	.0076	.044	350	19.9	87.1	89.5	85.9
Isotope Rougher Tail				66.7	0.48	.0055	.022	158	12.0	53.3	34.0	40.3
Final Tail				63.5	0.61	.0055	.019	180	11.8	40.5	28.0	35.2
Feed (calc.)				100.0	3.27	.0073	.0043	324	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.02	.0065	.034	248	100.0	100.0	100.0	100.0

TONS PER DAY = 10.3

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

TABLE 7
PYRITE-RADIUM FLOTATION PILOT PLANT - FLOWSHEET 11

AUGUST 31, 1978

PRODUCT	lbs/ton REAGENTS			ASSAYS					DISTRIBUTION %			
	Collector K.A.H.	O.A.	Froth P.O.	Weight %	Sulphide S %	% U	% Th	pCi/s Ra226	Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.33		2.29	8.1	39.70	.012	.040	485	93.8	18.1	8.1	1.6
Isotope Rougher Conc.		2.7		9.8	1.50	.011	.128	815	4.3	20.0	31.2	33.3
Isotope Scavenger Conc.		1.0		11.3	0.50	.012	.116	643	1.7	25.2	32.5	30.3
Combined Conc.		3.7		29.2	11.71	.012	.099	536	99.8	63.3	71.8	65.2
Pyrite Rougher Tail				91.9	0.27	.0066	.039	255	6.2	81.9	91.8	98.4
Isotope Rougher Tail				82.1	0.08	.0042	.024	213	1.9	61.9	60.7	65.1
Final Tail				70.8	0.01	.0042	.016	118	0.2	36.7	24.0	34.8
Feed (calc.)				100.0	3.43	.0054	.040	240	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.65	.0076	.041	240	100.0	100.0	100.0	100.0

TONS PER DAY = 17.3

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

TABLE 3

PYRITE-RADIUM FLOTATION PILOT PLANT - FLOWSHEET II SEPTEMBER 4, 1978

PRODUCT	lbs/ton REAGENTS			ASSAYS					DISTRIBUTION %			
	Collector K.A.H.	O.A.	Froth P.O.	Weight %	Sulphide S %	% U	% Th	pCi/s Ra226	Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.42		2.45	8.8	34.34	.0093	.038	517	90.8	15.1	10.5	15.6
Isotope Rougher Conc.		2.7		10.3	0.99	.0093	.089	746	3.1	17.7	28.9	26.4
Isotope Scavenger Conc.		0.8		3.6	2.13	.011	.126	1123	2.3	7.3	14.3	13.9
Combined Conc.		3.5		22.7	14.10	.0096	.075	717	96.2	40.1	53.7	55.9
Pyrite Rougher Tail				91.2	0.26	.0054	.027	244	9.2	84.9	89.5	84.4
Isotope Rougher Tail				80.9	0.11	.0067	.028	178	6.1	67.2	60.6	58.0
Final Tail				77.3	0.16	.0042	.019	166	3.8	59.9	46.3	44.1
Feed (calc.)				100.0	3.32	.0054	.032	291	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.35	.0047	.026	265	100.0	100.0	100.0	100.0

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

TONS PER DAY = 15.8

TABLE 9

PYRITE-RADIUM FLOTATION PILOT PLANT - FLOWSHEET 11 SEPTEMBER 5, 1978

PRODUCT	lbs/ton REAGENTS			ASSAYS					DISTRIBUTION %			
	Collector K.A.H.	O.A.	Froth P.O.	Weight %	Sulphide S %	% U	% Th	pCi/g Ra226	Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.33		1.98	7.9	42.81	.0085	.029	294	91.9	10.8	7.0	10.2
Isotope Rougher Conc.		2.7		9.8	1.58	.012	.105	700	4.2	19.1	31.2	30.0
Isotope Scavenger Conc.		0.8		10.7	0.75	.011	.070	570	2.2	19.0	22.7	26.7
Combined Conc.		3.5		28.0	12.92	.011	.072	546	98.3	48.9	60.9	66.9
Pyrite Rougher Tail				92.1	0.87	.0068	.034	278	8.1	89.2	93.0	89.8
Isotope Rougher Tail				82.3	0.10	.0044	.019	151	3.9	70.1	61.8	59.8
Final Tail				71.6	0.09	.0044	.018	106	1.7	51.1	39.1	33.1
Feed (calc.)				100.0	3.68	.0062	.033	228	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.66	.0058	.027	220	100.0	100.0	100.0	100.0

TONS PER DAY = 8.8

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

TABLE 10

PYRITE-RADIUM FLOTATION PILOT PLANT - FLOWSHEET 11 SEPTEMBER 9, 1978

	lbs/ton REAGENTS			ASSAYS					DISTRIBUTION %			
PRODUCT	Collector K.A.H.	O.A.	Froth P.O.	Weight %	Sulphide S %	% U	% Th	pCi/g Ra226	Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.26		2.48	7.0	45.13	.0081	.030	331	94.7	10.7	7.2	10.3
Isotope Rougher Conc.		3.0		9.5	1.53	.0093	.127	742	4.4	16.7	41.3	31.2
Isotope Scavenger Conc.		0.8		6.5	0.48	.0093	.018	472	0.9	11.4	4.0	13.6
Combined Conc.		3.8		23.0	14.50	.0089	.067	541	100.0	38.8	52.5	55.1
Pyrite Rougher Tail				93.0	0.17	.0048	.034	241	5.3	89.3	92.8	89.7
Isotope Rougher Tail				83.5	0.25	.0046	.023	130	0.9	72.6	51.5	58.5
Final Tail				77.0	0	.0042	.018	132	0	61.2	47.5	44.9
Feed (calc.)				100.0	3.34	.0052	.029	226	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.24	.0047	.032	199	100.0	100.0	100.0	100.0

TONS PER DAY = 7.2

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

TABLE 1

PYRITE-RADIUM FLOTATION PILOT PLANT - FLOWSHEET 11 September 7, 1978

PRODUCT	lbs/ton REAGENTS Collector K.A.H.	O.A.	Froth P.O.	ASSAYS Weight %	Sulphide S %	% U	% Th	pCi/s Ra226	DISTRIBUTION % Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.22		2.02	8.0	39.25	.012	.040	814	91.3	14.4	7.3	22.7
Isotope Rougher Conc.		2.7		13.3	1.57	.012	.129	430	6.1	24.0	39.2	20.0
Isotope Scavenger Conc.		0.7		7.3	0.55	.0093	.105	694	1.2	10.2	17.5	17.7
Combined Conc.		3.4		28.6	11.85	.011	.098	605	98.6	48.6	64.0	60.4
Pyrite Rougher Tail				92.0	0.36	.0053	.033	249	8.7	85.6	92.7	77.3
Isotope Rougher Tail				78.7	0.05	.0039	.019	154	2.6	61.6	53.5	57.3
Final Tail				71.4	0.07	.0048	.022	159	1.4	51.4	36.0	39.6
Feed (calc.)				100.0	3.44	.0067	.044	287	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.39	.0054	.031	263	100.0	100.0	100.0	100.0

TONS PER DAY = 9.0

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

TABLE 12

PYRITE-RADIUM FLOTATION PILOT PLANT - FLOWSHEET 11 September 8,1978

PRODUCT	lbs/ton REAGENTS			ASSAYS					DISTRIBUTION %			
	Collector K.A.H.	O.A.	Froth P.O.	Weight %	Sulphide S %	% U	% Th	pCi/s Ra226	Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.2		1.5	9.7	38.82	.011	.041	533	95.3	17.5	12.0	20.1
Isotope Rougher Conc.		2.4		1.7	2.28	.014	.158	953	1.0	3.9	8.1	6.3
Isotope Scavenger Conc.		0.6		15.8	0.61	.010	.034	537	2.4	26.0	40.2	33.0
Combined Conc.		3.0		27.2	14.34	.011	.073	562	98.7	47.4	60.3	59.4
Pyrite Rougher Tail				90.3	0.01	.0051	.033	227	4.7	82.5	88.0	79.9
Isotope Rougher Tail				88.6	0.21	.0053	.035	213	3.7	78.6	79.9	73.6
Final Tail				72.8	0.07	.0044	.018	143	1.3	52.6	39.7	40.6
Feed (calc.)				100.0	3.95	.0061	.033	257	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.74	.0054	.035	263	100.0	100.0	100.0	100.0

TONS PER DAY = 8.4

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

TABLE 13

September 11,1978

PYRITE-RADIUM FLOTATION PILOT PLANT - FLOWSHEET 11

PRODUCT	lbs/ton REAGENTS			ASSAYS					DISTRIBUTION %			
	Collector K.A.H.	O.A.	Froth P.O.	Weight %	Sulphide S %	% U	% Th	pCi/s Ra226	Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.2		0.7	6.8	41.47	.0076	.032	462	87.7	12.6	7.3	10.6
Isotope Rougher Conc.		2.4		7.2	2.84	.0081	.113	1012	6.4	14.2	27.4	24.7
Isotope Scavenger Conc.		0.7		6.5	1.36	.0078	.066	542	2.7	12.4	14.4	11.9
Combined Conc.		3.1		20.5	15.18	.0078	.071	681	96.8	39.2	49.1	47.2
Pyrite Rougher Tail				93.2	0.31	.0033	.028	294	12.3	87.4	92.7	89.4
Isotope Rougher Tail				86.0	0.52	.0029	.021	220	5.9	73.2	65.3	64.7
Final Tail				79.5	0.13	.0025	.019	196	3.2	60.8	50.9	52.8
Feed (calc.)				100.0	3.21	.0041	.030	295	100.0	100.0	36.5	100.0
Feed (Assay)				100.0	3.11	.0037	.027	229	100.0	100.0	100.0	100.0

TONS PER DAY = 14.7

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

TABLE 14

SEPTEMBER 12, 1978

PYRITE-RADIUM FLOTATION PILOT PLANT - FLOWSHEET 11

	lbs/ton REAGENTS			ASSAYS					DISTRIBUTION %			
PRODUCT	Collector K.A.H.	O.A.	Froth P.O.	Weight %	Sulphide S %	% U	% Th	pCi/g Ra226	Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.20		0.7	7.4	39.18	.0093	.031	442	90.7	15.8	8.3	13.6
Isotope Rougher Conc.		2.3		0.6	3.35	.010	.137	957	0.6	1.4	3.0	2.4
Isotope Scavenger Conc.		0.7		9.4	1.73	.0085	.091	641	5.1	18.3	31.3	25.1
Combined Conc.		3.0		17.4	17.71	.0089	.067	568	96.4	35.5	42.6	41.7
Pyrite Rougher Tail				92.6	0.320	.0043	.029	271	9.3	84.2	91.7	86.4
Isotope Rougher Tail				92.0	0.300	.0048	.032	231	8.7	82.8	88.7	84.0
Final Tail				82.6	0.14	.0034	.019	172	3.6	64.5	57.4	58.9
Feed (calc.)				100.0	3.19	.0044	.027	241	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.17	.0040	.029	220	100.0	100.0	100.0	100.0

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

TONS PER DAY = 14.7

TABLE 15 SEPTEMBER 13, 1978.

PYRITE-RADIUM FLOTATION PILOT PLANT - FLOWSHEET 11

PRODUCT	lbs/ton REAGENTS			ASSAYS					DISTRIBUTION %			
	Collector K.A.H.	O.A.	Froth P.O.	Weight %	Sulphide S %	% U	% Th	pCi/g Ra226	Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.14		0.42	7.0	38.45	.012	.040	413	80.4	13.7	6.4	9.7
Isotope Rougher Conc.		2.1		13.8	3.30	.010	.126	741	13.6	22.4	40.4	34.4
Isotope Scavenger Conc.		0.3		10.5	1.21	.010	.091	598	3.8	17.1	22.0	21.1
Combined Conc.		2.4		31.3	10.5	.011	.095	620	97.8	53.2	68.8	65.2
Pyrite Rougher Tail				93.0	0.52	.0059	.039	281	19.6	86.3	93.6	90.3
Isotope Rougher Tail				79.2	1.32	.0046	.034	220	6.0	63.9	53.2	55.9
Final Tail				68.7	0.11	.0042	.020	150	2.2	46.8	31.2	34.8
Feed (calc.)				100.0	3.35	.0062	.043	297	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.20	.0058	.038	265	100.0	100.0	100.0	100.0

TONS PER DAY = 15.0

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

TABLE 16 SEPTEMBER 14, 1978

PYRITE-RADIUM FLOTATION PILOT PLANT - FLOWSHEET 11

	lbs/ton REAGENTS			ASSAYS					DISTRIBUTION %			
PRODUCT	Collector K.A.H.	O.A.	Froth P.O.	Weight %	Sulphide S %	% U	% Th	pCi/s Ra226	Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.19		0.8	11.4	28.32	.012	.055	554	91.5	19.6	16.1	21.0
Isotope Rougher Conc.		2.1		5.6	2.26	.012	.130	811	3.6	9.6	18.7	15.1
Isotope Scavenger Conc.		0.7		6.2	1.45	.013	.112	768	2.6	11.5	17.8	15.8
Combined Conc.		2.8		23.2	14.85	.012	.088	672	97.7	40.7	52.6	51.9
Pyrite Rougher Tail				88.6	0.34	.0065	.033	286	8.5	80.4	83.9	79.0
Isotope Rougher Tail				83.0	0.21	.0064	.033	266	4.9	70.8	65.2	63.9
Final Tail				76.8	0.11	.0054	.024	189	2.3	59.3	47.4	48.1
Feed (calc.)				100.0	3.53	.0070	.039	301	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.52	.0068	.034	250	100.0	100.0	100.0	100.0

TONS PER DAY = 14.3

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

TABLE ;

PYRITE-RADIUM FLOTATION PILOT PLANT, FLOWSHEET 11 SEPTEMBER 15, 1978.

PRODUCT	lbs/ton REAGENTS			ASSAYS					DISTRIBUTION %			
	Collector K.A.H.	O.A.	Froth P.O.	Weight %	Sulphide S %	% U	% Th	pCi/g Ra226	Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.17		0.45	6.6	39.08	.0064	.030	369	73.0	6.2	6.0	8.0
Isotope Rougher Conc.		2.2		18.1	3.15	.014	.087	674	16.1	36.9	48.0	40.2
Isotope Scavenger Conc.		0.7		21.8	1.41	.013	.054	501	8.7	41.3	35.9	36.0
Combined Conc.		2.9		46.5	7.43	.013	.063	550	97.8	84.4	89.9	84.2
Pyrite Rougher Tail				93.4	0.63	.0056	.028	322	27.0	93.8	94.0	92.0
Isotope Rougher Tail				75.3	0.33	.0040	.018	150	10.9	56.9	46.0	51.8
Final Tail				53.5	0.14	.0020	.0062	90	2.2	15.6	10.1	15.8
Feed (calc.)				100.0	3.53	.0069	.033	304	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.13	.0063	.030	293	100.0	100.0	100.0	100.0

TONS PER DAY = 27.4

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

Note: Above table represents production for Sept. 15 and 16, 1978.

TABLE 16 SEPTEMBER 14, 1978

PYRITE-RADIUM FLOTATION PILOT PLANT - FLOWSHEET 11

	lbs/ton REAGENTS			ASSAYS					DISTRIBUTION %			
PRODUCT	Collector K.A.H.	O.A.	Froth P.O.	Weight %	Sulphide S %	% U	% Th	pCi/s Ra226	Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.19		0.8	11.4	28.32	.012	.055	554	91.5	19.6	16.1	21.0
Isotope Rougher Conc.		2.1		5.6	2.26	.012	.130	811	3.6	9.6	18.7	15.1
Isotope Scavenger Conc.		0.7		6.2	1.45	.013	.112	768	2.6	11.5	17.8	15.8
Combined Conc.		2.8		23.2	14.85	.012	.088	672	97.7	40.7	52.6	51.9
Pyrite Rougher Tail				88.6	0.34	.0065	.033	286	8.5	80.4	83.9	79.0
Isotope Rougher Tail				83.0	0.21	.0064	.033	266	4.9	70.8	65.2	63.9
Final Tail				76.8	0.11	.0054	.024	189	2.3	59.3	47.4	48.1
Feed (calc.)				100.0	3.53	.0070	.039	301	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.52	.0068	.034	250	100.0	100.0	100.0	100.0

TONS PER DAY = 14.3

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

TABLE 7

PYRITE-RADIUM FLOTATION PILOT PLANT, FLOWSHEET II — SEPTEMBER 15, 1978.

PRODUCT	lbs/ton REAGENTS Collector K.A.H.	O.A.	Froth P.O.	ASSAYS Weight %	Sulphide S %	% U	% Th	pCi/s Ra226	DISTRIBUTION % Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.17		0.45	6.6	39.08	.0064	.030	369	73.0	6.2	6.0	8.0
Isotope Rougher Conc.		2.2		18.1	3.15	.014	.087	674	16.1	36.9	48.0	40.2
Isotope Scavenger Conc.		0.7		21.8	1.41	.013	.054	501	8.7	41.3	35.9	36.0
Combined Conc.		2.9		46.5	7.43	.013	.063	550	97.8	84.4	89.9	84.2
Pyrite Rougher Tail				93.4	0.63	.0056	.028	322	27.0	93.8	94.0	92.0
Isotope Rougher Tail				75.3	0.33	.0040	.018	150	10.9	56.9	46.0	51.8
Final Tail				53.5	0.14	.0020	.0062	90	2.2	15.6	10.1	15.8
Feed (calc.)				100.0	3.53	.0069	.033	304	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.13	.0063	.030	293	100.0	100.0	100.0	100.0

TONS PER DAY = 27.4

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

Note: Above table represents production for Sept. 15 and 16, 1978.

TABLE 18

PYRITE-RADIUM FLOTATION PILOT PLANT - FLOWSHEET II SEPTEMBER 18, 1978

PRODUCT	lbs/ton REAGENTS			ASSAYS					DISTRIBUTION %			
	Collector K.A.H.	O.A.	Froth P.O.	Weight %	Sulphide S %	% U	% Th	pCi/g Ra226	Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.16		1.07	15.4	18.90	.010	.045	557	92.0	29.1	26.1	30.3
Isotope Rougher Conc.		2.6		17.3	1.00	.012	.078	680	5.5	39.3	50.8	41.6
Isotope Scavenger Conc.		0.5		5.5	0.57	.0093	.048	481	1.0	9.6	9.9	9.4
Combined Conc.		3.1		38.2	8.16	.011	.060	602	98.5	78.0	86.8	81.3
Pyrite Rougher Tail				84.6	0.30	.0047	.025	278	8.0	70.9	73.9	69.7
Isotope Rougher Tail				67.3	0.12	.0036	.013	159	2.5	31.6	23.1	28.1
Final Tail				61.8	0.08	.0019	.0057	86	1.5	22.0	13.2	18.7
Feed (calc.)				100.0	3.16	.0053	.027	283	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.13	.0050	.023	254	100.0	100.0	100.0	100.0

TONS PER DAY = 16.8

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

TABLE 15

PYRITE RADIUM FLOTATION PILOT PLANT - FLOWSHEET 11 SEPTEMBER 19,1978

PRODUCT	lbs/ton REAGENTS			ASSAYS					DISTRIBUTION %			
	Collector K.A.H.	O.A.	Froth P.O.	Weight %	Sulphide S %	% U	% Th	pCi/s Ra226	Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.12		0.60	6.5	37.87	.0082	.030	384	81.0	9.4	6.3	9.1
Isotope Rougher Conc.		2.4		14.3	2.04	.014	.103	732	9.6	35.4	47.7	38.0
Isotope Scavenger Conc.		0.5		5.0	1.40	.012	.076	573	2.3	10.6	12.3	10.4
Combined Conc.		2.9		25.8	10.94	.012	.079	614	92.9	55.4	66.3	57.5
Pyrite Rougher Tail				93.5	0.60	.0044	.028	294	19.0	90.6	93.7	90.9
Isotope Rougher Tail				79.2	0.36	.0030	.021	193	9.4	55.2	46.0	52.9
Final Tail				74.2	0.29	.0034	.014	158	7.1	44.6	33.7	42.5
Feed (calc.)				100.0	3.04	.0057	.031	276	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.01	.0045	.028	250	100.0	100.0	100.0	100.0

TONS PER DAY = 16.2

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

TABLE 20

SEPTEMBER 20, 1978.

PYRITE-RADIUM FLOTATION PILOT PLANT - FLOWSHEET 11

PRODUCT	lbs/ton REAGENTS			ASSAYS					DISTRIBUTION %			
	Collector K.A.H.	O.A.	Froth P.O.	Weight %	Sulphide S %	% U	% Th	pCi/s Ra226	Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.08		0.41	8.6	30.79	.011	.033	461	87.2	20.7	10.8	16.0
Isotope Rougher Conc.		2.4		14.7	1.34	.0093	.087	562	6.5	29.9	48.5	33.3
Isotope Scavenger Conc.		0.3		9.1	1.21	.0093	.051	484	3.6	18.5	17.6	17.8
Combined Conc.		2.7		32.4	9.12	.0098	.061	514	97.3	69.1	76.9	67.1
Pyrite Rougher Tail				91.4	0.38	.0043	.024	258	12.8	79.3	89.2	84.0
Isotope Rougher Tail				76.7	0.34	.0027	.016	170	6.3	49.4	40.7	50.7
Final Tail				67.6	0.12	.0021	.0097	121	2.7	30.9	23.1	32.9
Feed (calc.)				100.0	3.04	.0046	.026	248	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	2.93	.0043	.025	228	100.0	100.0	100.0	100.0

TONS PER DAY = 15.8

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

FLOTATION 11
PYRITE-RADIUM FLOTATION PILOT PLANT

TABLE 21

SEPTEMBER 21, 1978

PRODUCT	lbs/ton REAGENTS			ASSAYS					DISTRIBUTION %			
	Collector K.A.H.	O.A.	Froth P.O.	Weight %	Sulphide S %	% U	% Th	pCi/s Ra226	Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.14		0.61	11.7	23.21	.011	.048	582	91.0	20.5	17.6	23.3
Isotope Rougher Conc.		2.1		15.6	0.82	.013	.078	650	4.3	32.3	38.0	34.6
Isotope Scavenger Conc.		0.4		17.0	0.57	.011	.059	438	3.3	29.8	31.4	25.4
Combined Conc.		2.5		44.0	6.68	.012	.063	554	98.6	82.6	87.0	83.3
Pyrite Rougher Tail				88.3	0.27	.0057	.030	298	9.0	79.5	82.4	76.7
Isotope Rougher Tail				72.7	0.17	.0047	.020	163	4.7	47.2	44.4	42.1
Final Tail				55.0	0.08	.0020	.0076	89	1.4	17.4	13.0	16.7
Feed (calc.)				100.0	2.98	.0063	.032	293	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.00	.0051	.028	254	100.0	100.0	100.0	100.0

TONS PER DAY = 17.3

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

TABLE

TEST COMPOSITE - FLOWSHEET II

PRODUCT	lbs/ton REAGENTS Collector K.A.H.	O.A.	Froth P.O.	ASSAYS Weight %	Sulphide S %	% U	% Th	pCi/s Ra226	DISTRIBUTION % Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.20		1.3	8.2	35.19	.0093	.039	443	89.3	13.6	9.5	13.8
Isotope Rougher Conc.		3.1		10.5	1.90	.011	.111	672	6.2	20.6	34.8	26.8
Isotope Scavenger Conc.				10.7	1.16	.010	.082	653	3.8	19.1	26.2	26.5
Combined Conc.				29.4	10.92	.010	.080	601	99.3	53.3	70.5	67.1
Pyrite Rougher Tail				91.8	0.43	.0058	.033	284	10.7	86.4	90.5	86.2
Isotope Rougher Tail				81.3	0.11	.0056	.023	192	4.5	65.8	55.7	59.4
Final Tail				70.6	0.03	.0037	.014	123	4.5	46.7	29.5	32.9
Feed (calc.)				100.0	3.23	.0056	.033	264	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.27	.0058	.031	253	100.0	100.0	100.0	100.0

TOTAL TONS MILLED FLOWSHEET I = 74.2

TOTAL TONS MILLED FLOWSHEET II= 240.2

TOTAL TONS MILLED = 314.4

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

\BLE 23

DAILY RESULTS AVERAGE = FLOWSHEET 11

PRODUCT	lbs/ton REAGENTS			ASSAYS					DISTRIBUTION %			
	Collector K.A.H.	O.A.	Froth P.O.	Weight %	Sulphide S %	% U	% Th	pCi/g Ra226	Pyrite	U	Th	Ra226
Pyrite Rougher Conc.	0.20		1.3	8.9	34.48	.0098	.038	472	88.6	15.6	9.4	14.3
Isotope Rougher Conc.		3.1		11.7	1.75	.011	.108	743	5.9	23.1	35.2	29.6
Isotope Scavenger Conc.				9.8	1.06	.010	.082	613	3.0	17.6	22.4	20.4
Combined Conc.				30.4	11.18	.010	.080	626	97.5	56.3	67.0	64.3
Pyrite Rougher Tail				91.1	0.42	.0053	.032	282	11.4	84.4	90.6	85.7
Isotope Rougher Tail				79.4	0.30	.0044	.024	192	5.5	61.3	55.4	56.1
Final Tail				69.6	0.13	.0035	.017	151	2.5	43.7	33.0	35.7
Feed (calc.)				100.0	3.47	.0056	.036	294	100.0	100.0	100.0	100.0
Feed (Assay)				100.0	3.24	.0055	.031	251	100.0	100.0	100.0	100.0

K.A.X. Potassium Amy Xanthate
O.A. Oleic Acid
P.O. Pine Oil

TABLE 24

SIZE ANALYSIS AND ASSAY DISTRIBUTION

FLOTATION FEED COMPOSITE FLOWSHEET 11

		ASSAY			DISTRIBUTION		
TYLER MESH	% WEIGHT	U %	Th %	Ra^{226} pCi/g	U %	Th %	Ra^{226} %
+ 48	4.1	.0033	.0028	32	2.2	0.4	0.6
65	8.7	.0034	.0028	54	4.7	0.8	2.0
100	12.3	.0046	.0048	68	9.0	1.9	3.6
150	13.0	.0052	.0071	110	10.8	2.9	6.1
200	9.7	.0067	.011	108	10.3	3.4	4.5
-200	52.2	.0076	.055	373	63.0	90.6	83.2
Total Calc.	100.0	.0063	.032	234	100.0	100.0	100.0
Total (Assay)	100.0	.0058	.031	253	100.0	100.0	100.0

TABLE 25

SIZE ANALYSIS AND ASSAY DISTRIBUTION

PYRITE ROUGHER CONCENTRATE COMPOSITE

FLOWSHEET 11

		ASSAY			DISTRIBUTION		
TYLER MESH	% WEIGHT	U %	Th %	Ra^{226} pCi/g	U %	Th %	Ra^{226} %
+ 48	0.6	-	-	-	-	-	-
65	3.1	-	-	-	-	-	-
100	6.9	*.020	*.019	*432	2.4	6.3	10.6
150	12.7	.014	.024	378	20.1	9.5	11.1
200	13.2	.0072	.017	324	10.7	7.0	9.9
-200	63.5	.0063	.039	465	66.8	77.2	68.4
Total Calc.	100.0	.0089	.032	432	100.0	100.0	100.0
Total Assay	100.0	.0093	.039	443	100.0	100.0	100.0

* Assay Reported is + 100 mesh fraction

TABLE 26

SIZE ANALYSIS AND ASSAY DISTRIBUTION

FLOWSHEET 11

ISOTOPE ROUGHER TAIL

TYLER MESH	% WEIGHT	ASSAY U %	ASSAY Th %	ASSAY Ra^{226} pCi/l	DISTRIBUTION U %	DISTRIBUTION Th %	DISTRIBUTION Ra^{226} %
+ 48	4.8	.0025	.0033	43	2.2	0.8	1.6
65	9.8	.0025	.0019	36	4.4	0.9	2.7
100	13.1	.0031	.0024	48	7.3	1.5	4.8
150	14.3	.0027	.0038	68	7.0	3.3	7.4
200	10.1	.0040	.0077	76	7.3	3.7	5.8
-200	47.9	.0037	.039	214	71.8	89.8	77.7
Total Calc.)	100.0	.0055	.021	132	100.0	100.0	100.0
Total (Assay)	100.0	.0056	.023	192	100.0	100.0	100.0

TABLE 27

SIZE ANALYSIS AND ASSAY DISTRIBUTION

PYRITE ROUGHER TAIL COMPOSITE

FLOWSHEET 11

		ASSAY			DISTRIBUTION		
TYLER MESH	% WEIGHT	U %	Th %	Ra^{226} pCi/g	U %	Th %	Ra^{226} %
+ 48	4.3	.0021	.0020	43	1.5	0.3	0.9
65	8.6	.0025	.0022	31	3.6	0.6	1.3
100	12.1	.0034	.0032	55	6.8	1.2	3.2
150	12.8	.0037	.0052	78	7.9	2.0	4.7
200	9.5	.0037	.0076	70	5.8	2.2	3.2
-200	52.7	.0085	.058	347	74.4	93.7	86.7
Total (Calc.)	100.0	.0060	.033	211	100.0	100.0	100.0
Total (Assay)	100.0	.0058	.033	284	100.0	100.0	100.0

TABLE 28

SIZE ANALYSIS AND ASSAY DISTRIBUTION

ISOTOPE ROUGHER CONCENTRATE COMPOSITE

FLOWSHEET 11

TYLER MESH	% WEIGHT	ASSAY			DISTRIBUTION		
		U %	Th %	Ra^{226} pCi/g	U %	Th %	Ra^{226} %
+ 48	0.3	-	-	-	-	-	-
65	0.7	-	-	-	-	-	-
100	0.7	-	-	-	-	-	-
150	0.8	-	-	-	-	-	-
200	0.9	*.013	*.055	*324	4.3	1.7	1.3
-200	96.9	.010	.111	872	95.7	98.3	98.7
Total (Calc.)	100.0	.010	.109	856	100.0	100.0	100.0
Total (Assay)	100.0	.011	.111	672	100.0	100.0	100.0

* Assay Reported is +200 Fraction

TABLE 29

SIZE ANALYSIS AND ASSAY DISTRIBUTION

FLOWSHEET 11

ISOTOPE SCAVENGER CONCENTRATE COMPOSITE

TYLER MESH	% WEIGHT	ASSAY U %	ASSAY Th %	ASSAY Ra^{226} pCi/g	DISTRIBUTION U %	DISTRIBUTION Th %	DISTRIBUTION Ra^{226} %
+ 48	0.6	—	—	—	—	—	—
65	1.4	-	-	-	-	-	-
100	1.5	-	-	-	-	-	-
150	1.8	-	-	-	-	-	-
200	2.0	*.019	*.026	*293	11.1	2.3	3.4
- 200	92.7	.012	.086	648	88.9	97.7	66.6
Total (Calc.)	100.0	.013	.082	622	100.0	100.0	100.0
Total (Assay)	100.0	.010	.082	653	100.0	100.0	100.0

* Assay Reported is + 200 Fraction

TABLE 30

SIZE ANALYSIS AND ASSAY DISTRIBUTION

FINAL TAIL COMPOSITE - FLOWSHEET 11

		ASSAY			DISTRIBUTION		
TYLER MESH	% WEIGHT	U %	Th %	Ra^{226} pCi/g	U %	Th %	Ra^{226} %
+ 48	1.8	.0019	<.001	20	0.8	0.4	0.4
65	12.8	.0020	.0012	37	5.8	1.1	4.7
100	14.5	.0034	.0019	51	11.2	2.0	7.3
150	17.1	.0041	.0046	53	16.0	5.6	8.9
200	10.4	.0042	.0070	66	9.9	5.2	6.8
-200	43.4	.0057	.028	169	56.3	85.7	71.9
Total (Calc.)	100.0	.0044	.014	102	100.0	100.0	100.0
Total (Assay)	100.0	.0037	.014	123	100.0	100.0	100.0

TABLE 31

FINAL TAIL TRUCK COMPOSITE ANALYSIS

	U	-	.0037 %
	Th	-	.014 %
Sulphide	S	-	.09 %
	Ra^{226}	-	114 pCi/l

TABLE 32

ANALYSIS OF REPULPING SOLUTION

	U g/l	Th g/l	Dissolved Ra^{226} pCi/l
Sept. 5 - 8, 1978	.0078	.018	1179
Sept. 11 - 14,1978	.0023	<.01	492
Sept. 18 - 21,1978	.0010	<.01	586

POOR

QUALITY

ORIGINAL